10 Rückblick und Ausblick

Literatur:

A. Holzinger: Basiswissen Multimedia Band 2, Modul 4

J. Hasebrook: Multimedia-Psychologie, Kapitel 7 und 8

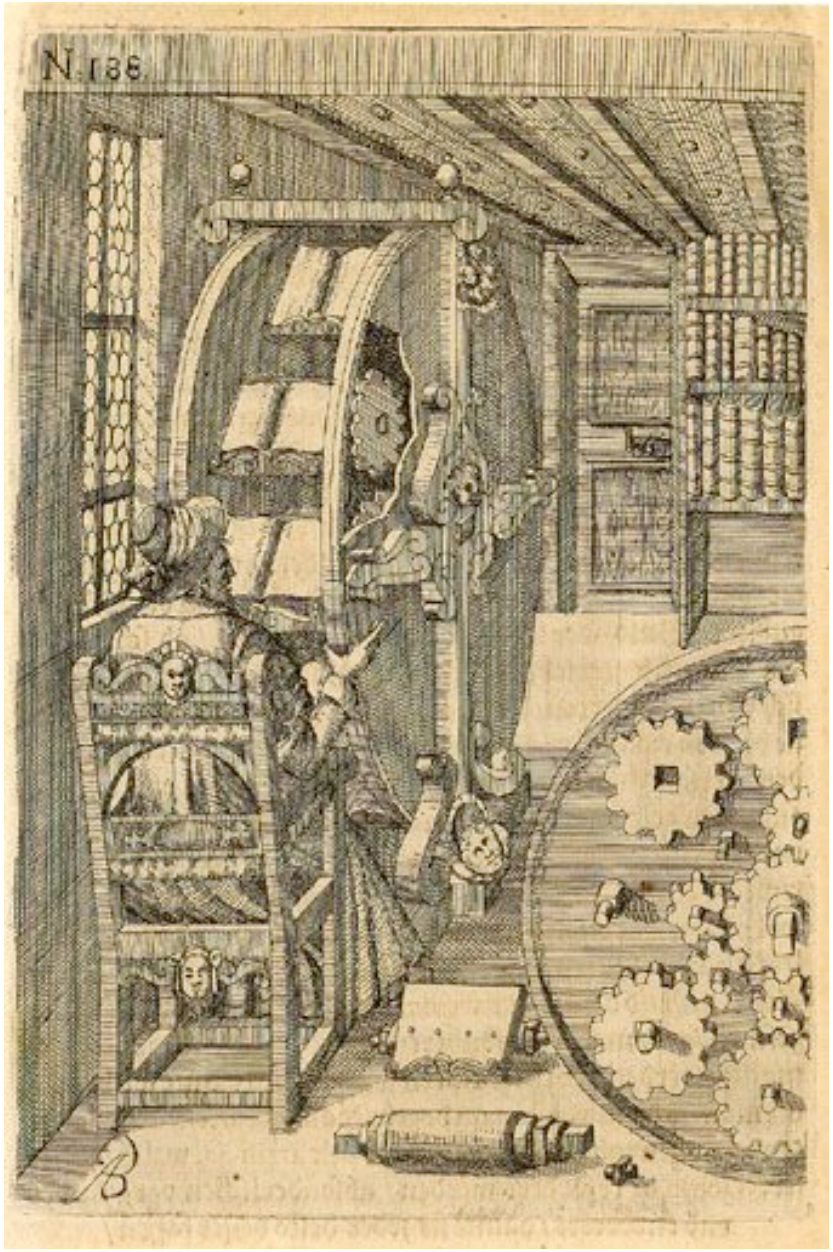
Römische Lernhilfen

- Römisch, ca. 200 v. Chr.
- Studenten mit Schiefertafeln *(slates)*

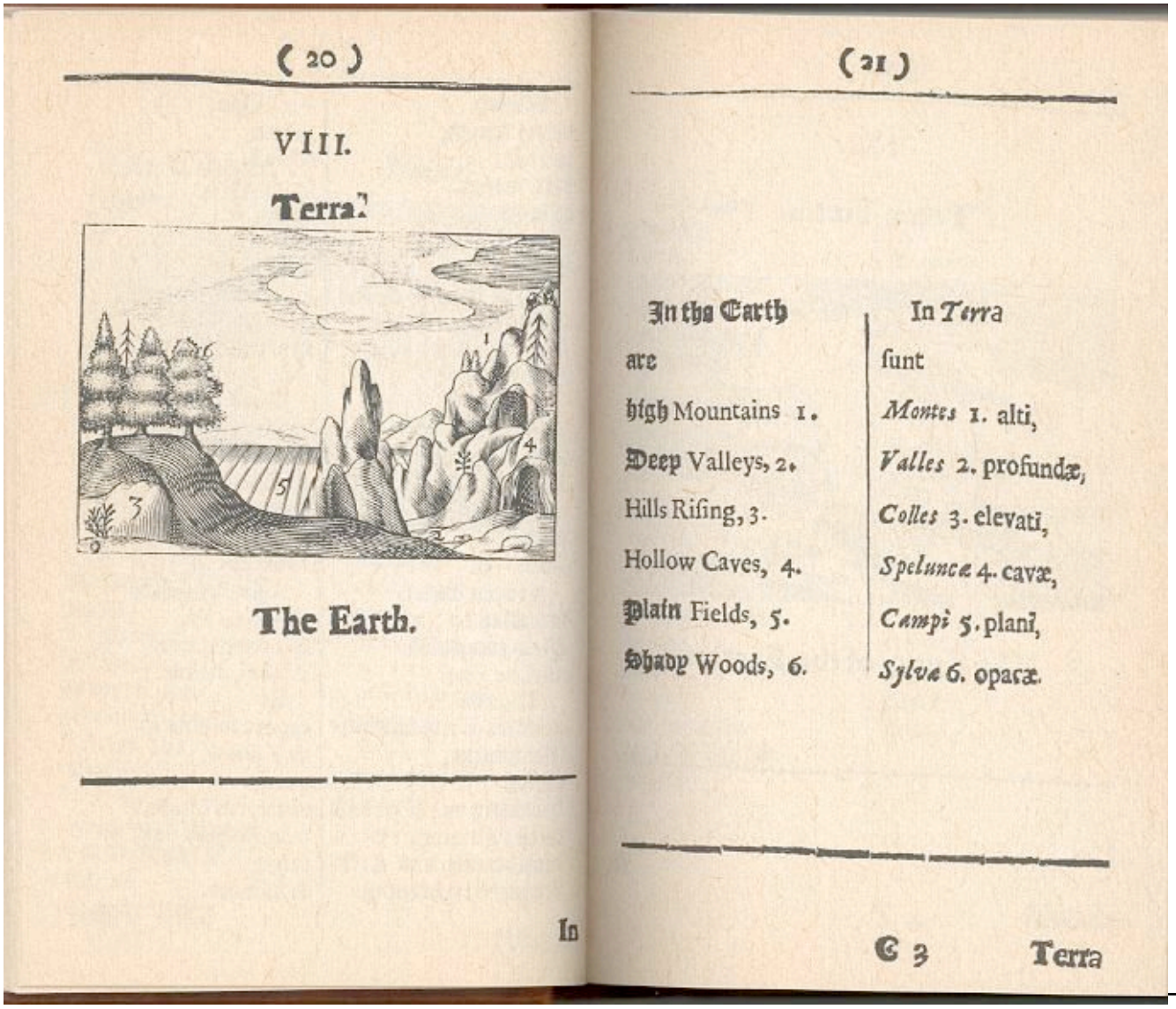
- Quelle: http://www.leerbeleving.nl/wbts/1/history_of_elearning.html

Ramellis Lesemaschine

- Agostino Ramelli (1531 – 1600)
- Rotierendes Lesepult zur gleichzeitigen Lektüre mehrerer aufgeschlagener Bücher (1588)
- Paralleler Informationszugang
- „Bookmarking“



J. A. Comenius: Orbis sensualium pictus (1658)



(20)

VIII.

Terra.

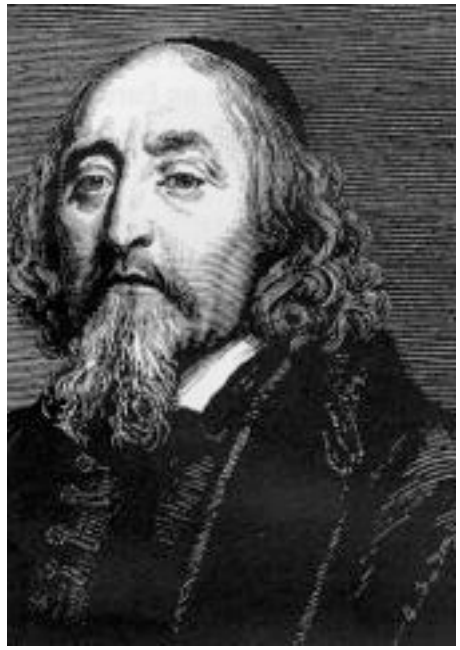
The Earth.

In

(21)

In the Earth	In *Terra*
are	sunt
high Mountains 1.	*Montes* 1. alti,
Deep Valleys, 2.	*Valles* 2. profundæ,
Hills Rising, 3.	*Colles* 3. elevati,
Hollow Caves, 4.	*Spelunca* 4. cavæ,
Plain Fields, 5.	*Campi* 5. plani,
Shady Woods, 6.	*Sylvæ* 6. opacæ.

C 3 Terra



Jan Amos Komensky
(= Comenius)
(1592 – 1670)

Integrierte
Text-Bild-Kombination
(Multimedia?)

Anfänge des Fernunterrichts

- 1728, Caleb Phillips und 1840, Isaac Pitman:
  - Stenographie-Unterricht per Post
- 1874, Illinois Weslyan University:
  - Offizieller Start von institutionellem Fernunterricht
- 1909, E. M. Forster: “The Machine Stops” (Kurzgeschichte)
  - Audiovisuelle Fernvorlesung zu australischer Musik
  - http://archive.ncsa.illinois.edu/prajlich/forster.html

> “The clumsy system of public gatherings had been long since abandoned; neither Vashti nor her audience stirred from their rooms. Seated in her armchair she spoke, while they in their armchairs heard her, fairly well, and saw her, fairly well. “

http://en.wikipedia.org/wiki/History_of_virtual_learning_environments

10 Rückblick und Ausblick

Literatur:

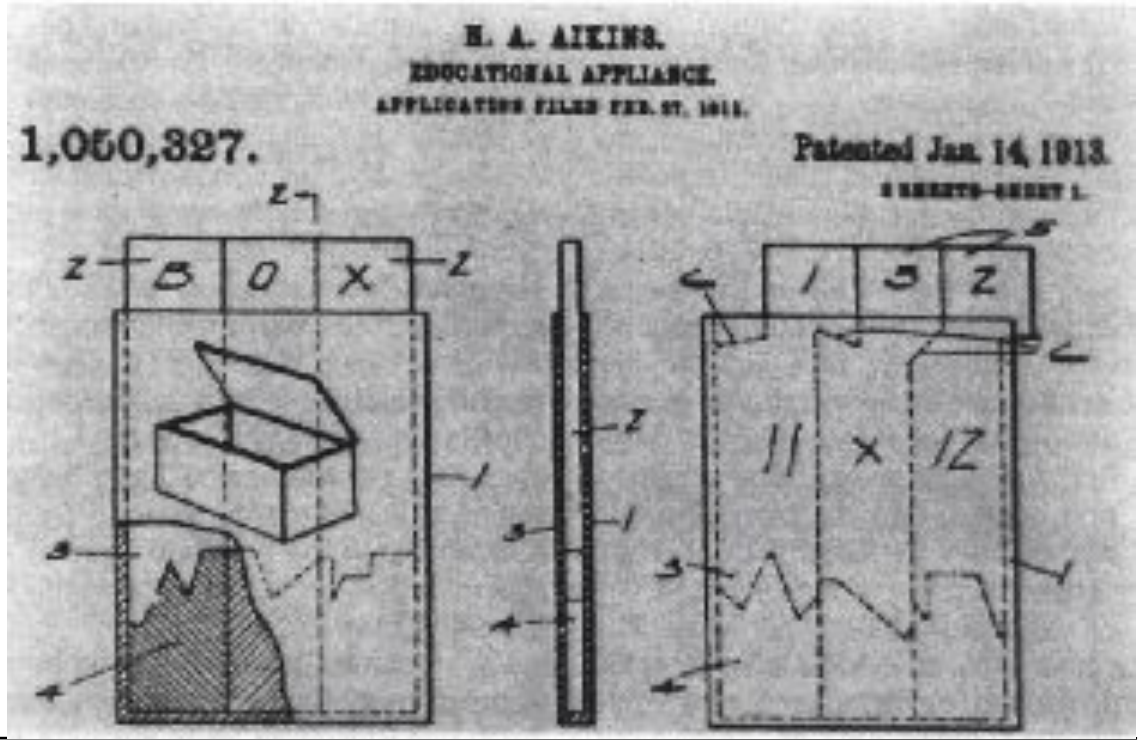
A. Holzinger: Basiswissen Multimedia Band 2, p. 176-182

J. Hasebrook: Multimedia-Psychologie, Kapitel 7 und 8

H. Niegemann et al.: Kompendium E-Learning, Kapitel 1

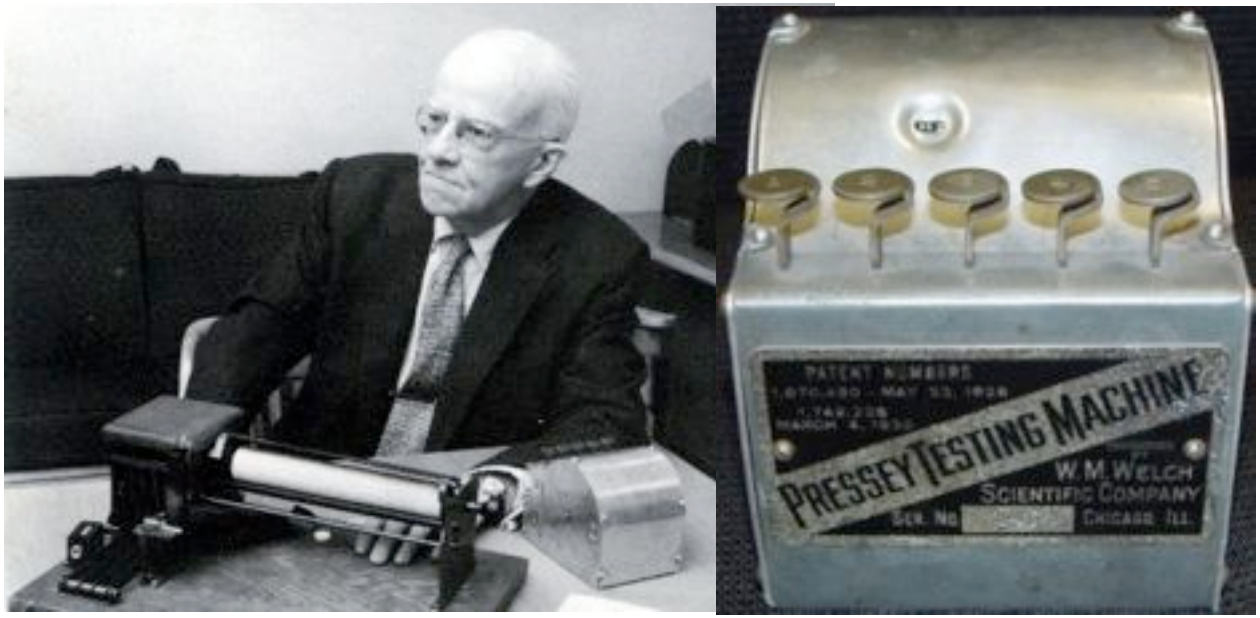
Buchstabiermaschinen

- Maschinen für das Buchstabieren und Schreiben von Wörtern
- Halcyon Skinner (patentiert 1866):
  Kasten mit Bildanzeige, Handkurbel und Tastatur
  - Handkurbel → Neues Bild
  - Eintippen der Bezeichnung (akzeptiert jede Eingabe)
- Herbert Aikins (1911)
  - Beeinflusst von Thorndike
  - Buchstabenstreifen werden hinter Bild gesteckt
  - Nur richtiges Wort passt (Puzzle-artig)



Pressey‘s Intelligenztest-Maschine

- Sidney Leavit Pressey (1888 – 1979), beeinflusst von Thorndike
- Patentiert 1928 eine „Maschine für Intelligenztests“
- Mehrfachwahlaufgaben mit bis zu vier Antwortalternativen
- Nummerierte Tasten zur Eingabe der Antwort
- Zähler für richtige Antworten
- Lernmodus: Nächste Aufgabe erst, wenn aktuelle gelöst
- Bonbon-Spender!
  - Problem: intrinsische/ extrinsische Motivation



Burrhus Skinner: Programmierte Unterweisung

- Rezession lähmt auch Anwendung von Lernmaschinen
- Nach dem 2. Weltkrieg: „Babyboom“, „Sputnik-Schock“, …
- Programmiertes Lernen nach Skinner
  (ca. 1958, angeblich aufgrund von Beobachtungen in Grundschule):
  - Jede Antwort bekommt eine sofortige Rückmeldung.
  - Jeder Schüler arbeitet in seinem individuellen Tempo.
  - Lernziele sind klar und objektiv formuliert.
  - Aufgaben sind so gestellt, dass sie mit hoher Wahrscheinlichkeit richtig gelöst werden.
  - Unterrichtsstoff zerlegt in „Frames“ (Frage- und Antwortkombinationen)
  - Lernende werden zur Aktivität angeleitet.
  - Ausdauerndes und gutes Arbeiten führt zu Zusatzbelohnungen.
- Basis vieler (der meisten?) Lernprogramme bis heute!

Example of Original Skinner Frames

Frame 1	MANUFACTURE means to make or build. Chair factories manufacture chairs. Copy the word here: __ __ __ __ __ __ __ __ __ __ __ __
Frame 2	Part of the word is like part of the word FACTORY. Both parts come from an old word meaning make or build. M A N U ___ ___ ___ ___ U R E
Frame 3	Part of the word is like part of the word MANUAL. Both parts come from an old word for hand. Many things are made by hand. ___ ___ ___ F A C T U R E

- From Skinner, B.F. (1958). Teaching machines. *Science, 128* (3330), 969-977.

10 Rückblick und Ausblick

Literatur:

A. Holzinger: Basiswissen Multimedia Band 2, p. 176-182

J. Hasebrook: Multimedia-Psychologie, Kapitel 7 und 8

H. Niegemann et al.: Kompendium E-Learning, Kapitel 1

Project PLATO

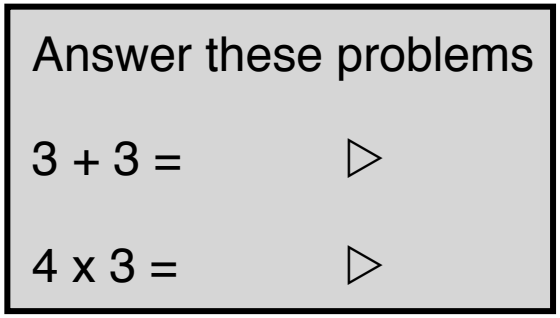
- PLATO (from 1960)
  - (Programmed Logic for Automated Teaching Operation)
  - University of Illinois, Donald Bitzer
  - PLATO I – III (until 1966)
- PLATO IV (1972), Computer-based Education Laboratory (CERL)
  - Plasma display
  - Touch screen
  - TUTOR language for session design
  - Graphics, animations
  - Message exchange among users, message boards (notes), chat rooms
  - Flight simulator, multiplayer games
- Commercial product until 1986
- See www.cyber1.org

Example for TUTOR Script

```
unit    math
at      205
write   Answer these problems

        3 + 3 =

        4 x 3 =
arrow   413
answer  6
arrow   613
answer  12
```



http://en.wikipedia.org/wiki/TUTOR_(programming_language)

PLATO Evaluation

- No significant difference between learning with the system and traditional learning
- Drop-out quote not higher than in traditional learning
- Reasonable acceptance
- 70% of students used the system outside course times
- 88% of teachers planned to work with the system again
- However:
  83% of students stated that a full course taught only by PLATO is unsatisfactory.

O‘Shea and Self 1986

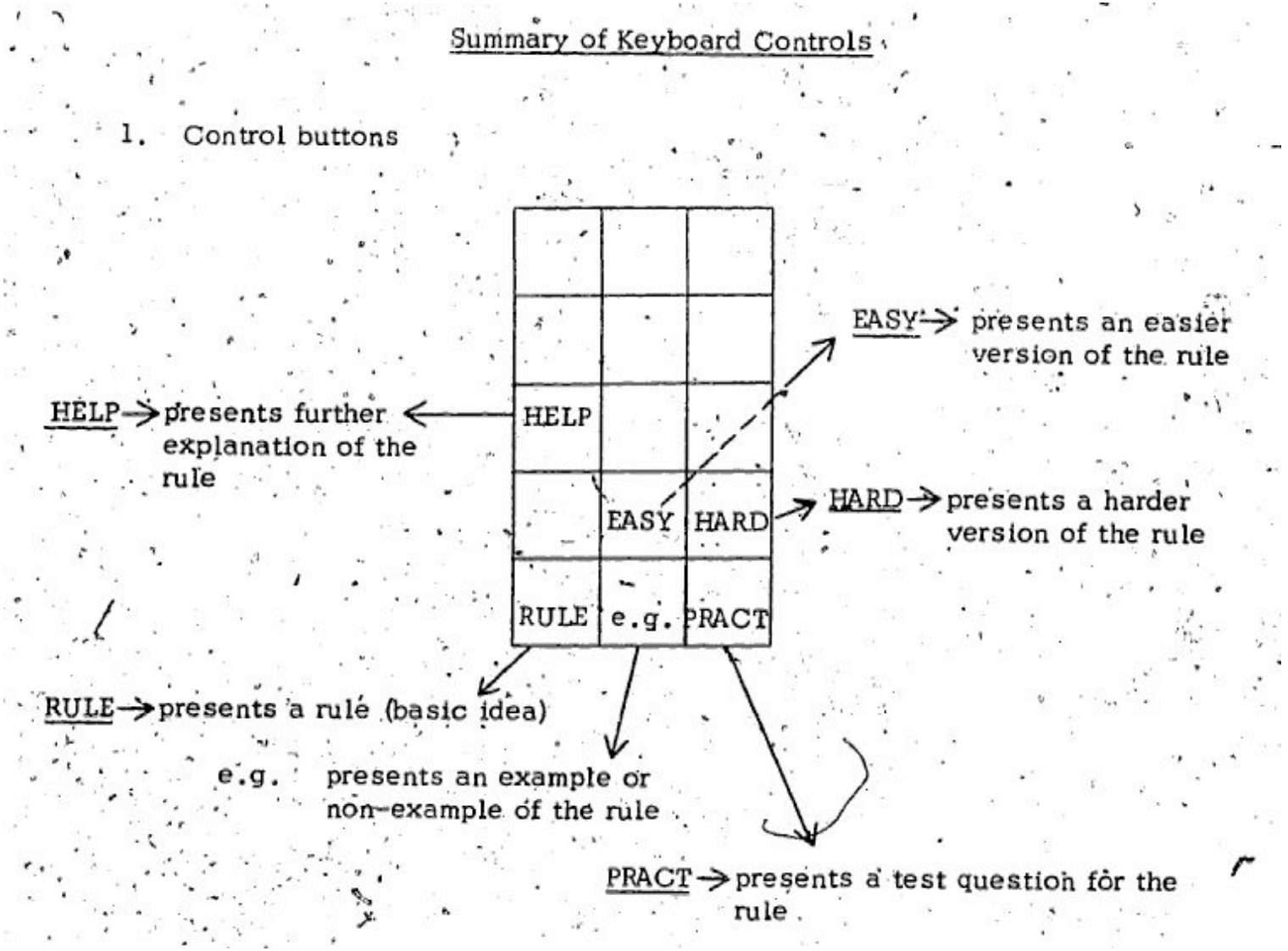
Project TICCIT

- TICCIT (1971 – 1977)
  - (Time-Shared Interactive Computer Controlled Information Television)
  - Developed at the University of Texas and Brigham Young University
  - Together with PLATO 60 mio $ funding
  - Audience: adult learners, but later version for elementary schools

Interactive Television system : TICCIT

- Goal: Compare class-room and computer-based instruction
- Hardware:
  - Color monitor with loudspeaker (TV)
  - Special keyboard
  - Lightpen (Lichtgriffel)
  - Video tape player

TICCIT Keyboard

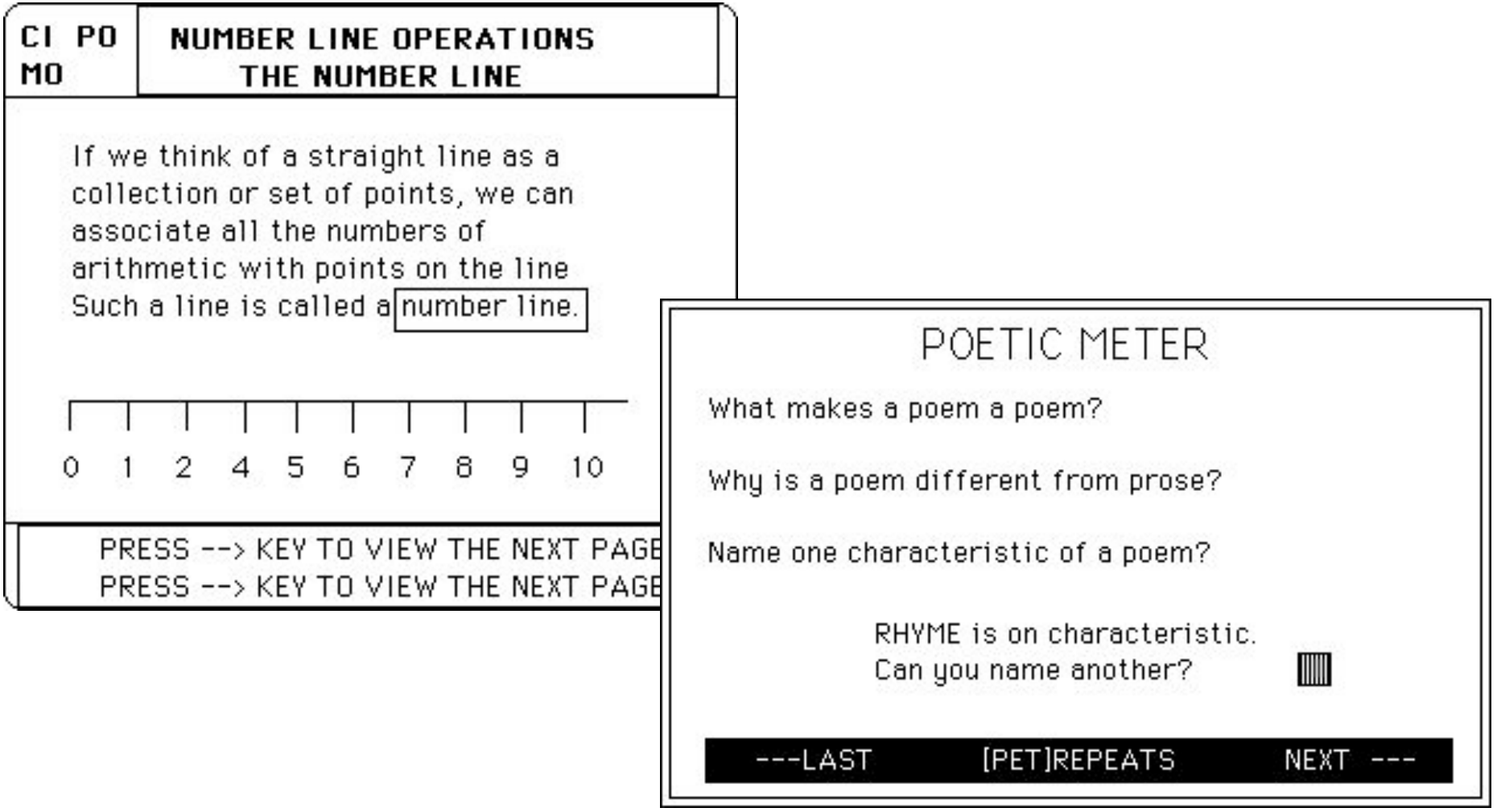


More:

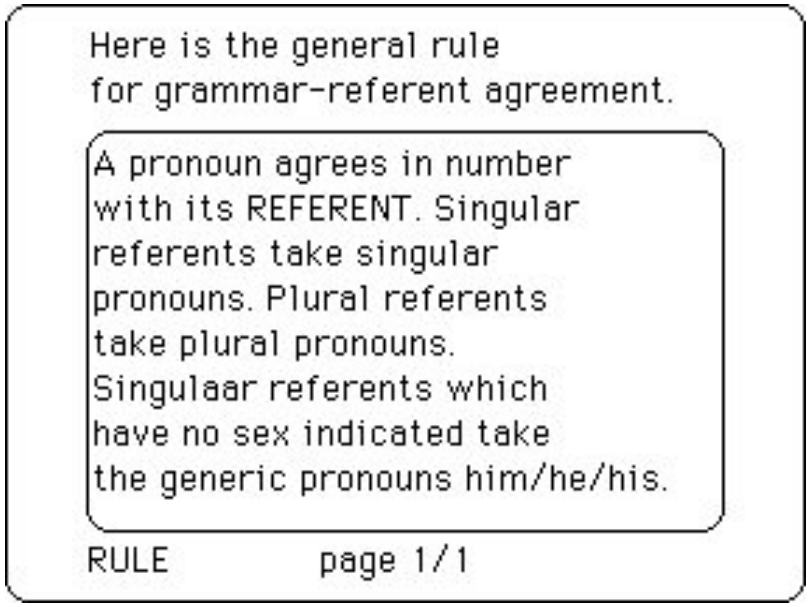
- Attention
- Exit
- Repeat
- Go
- Skip
- Back
- Objective
- Map
- Advice

http://eric.ed.gov, document ED16006

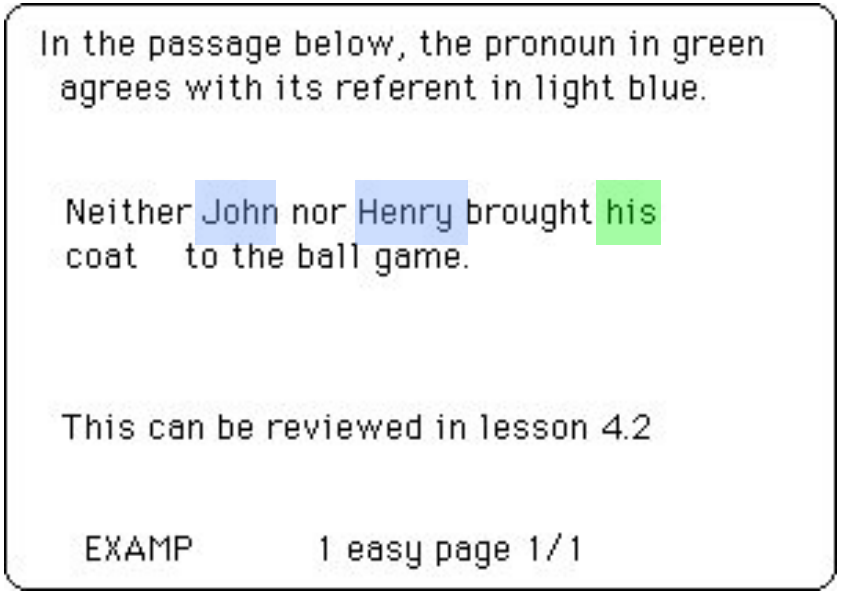
Examples from TICCIT (1)

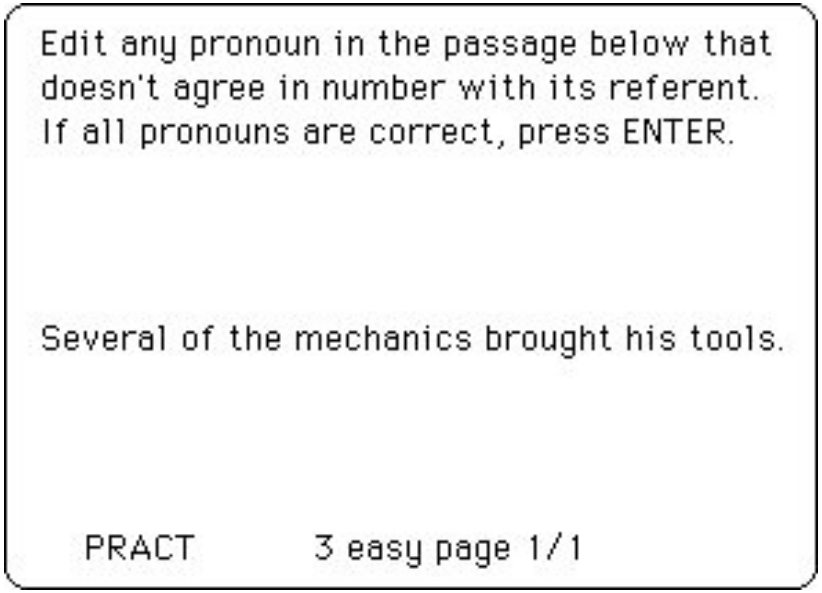


Examples from TICCIT (2)



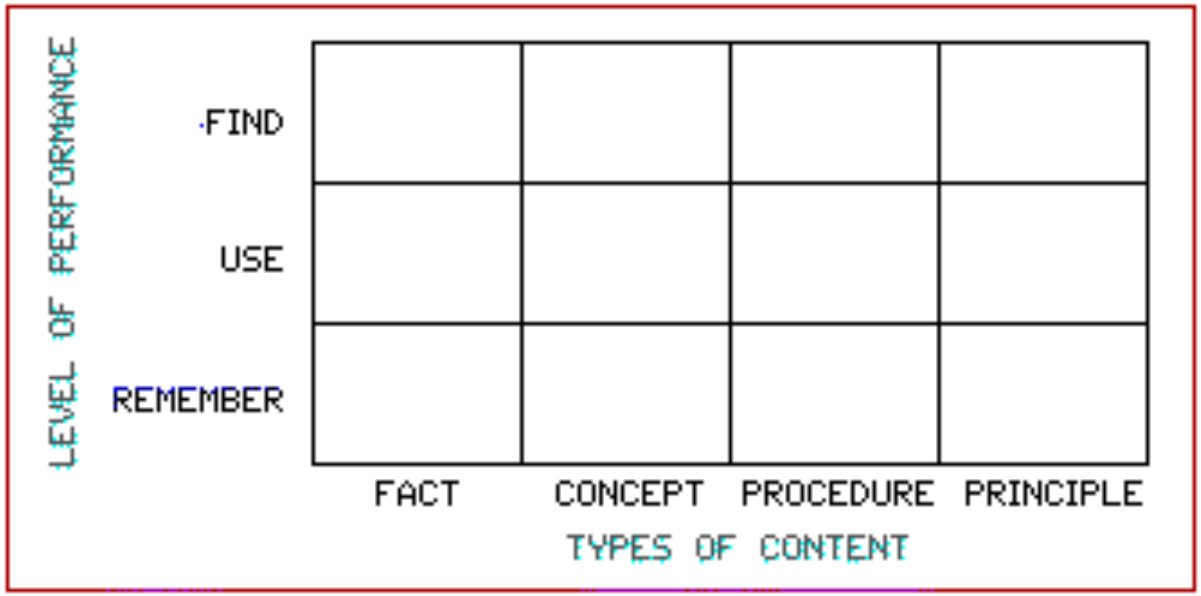
- TICCIT lessons were designed according to Merrill's CDT





Component Display Theory

- M. David Merrill (1983):
  CDT (Component Display Theory)
  - Basic ideas already used in the TICCIT-System!
- Performance/content matrix:
  - Level of learner performance
  - Types of content
- Presentation forms:
  - Rules
  - Examples
  - Repetition
  - Practice
  - …



- Revised and extended theory by M.D. Merrill:
  - Instructional Transaction Theory (ITT)

Non-Computerized CDT Example

There are several important events in the invention of the microscope. You will be required to remember each of these events.
Learning Tip: Use the following cards for drill. Look at the front and say the information on the back. Shuffle the cards and try again. Repeat until you make no mistakes and your answers are immediate.

Front	Back
First magnifying glass What?	Glass globe filled with water
First magnifying glass Who?	Used by engravers
First solid glass lens When?	Late 1200's A.D.
First compound microscope Who?	Zacharias Janssen
First compound microscope When?	About 1590 A.D.

TICCIT Evaluation

- Evaluation by ETS (Eduational Testing Service) was mixed:
  - TICCIT mathematics and English course students reported "significant achievement" over the traditional classroom formats
    - » For those students who completed the TICCIT courses!
  - Drop-out rate around 50%, 84% for math courses!
  - More students favored lecture classes over TICCIT math courses
  - Acceptance by teachers quite low

Computers in the Classroom

- Relatively cheap personal computers enable high penetration of schools with computer systems
- Wide-spread development of programmed instruction and simulations

Apple II
(1977–1993)
ca. US$ 1300

10 Rückblick und Ausblick

Literatur:

A. Holzinger: Basiswissen Multimedia Band 2, S. 193 – 198

R. Schulmeister: Grundlagen hypermedialer Lernsysteme, Kap. 5 + 6

D.H. Jonassen (ed): Handbook of Research on Educational Communications and Technology, 2nd ed. 2004.

History of Intelligent Tutoring Systems

- SCHOLAR (Carbonell, Collins et al. 1979): Geography
  - Socratic dialogue (asking the learner)
  - Mixed initiative
- SOPHIE (Burton, Brown et al. 1982): Electronic Circuits
  - Computer simulation of faulty hardware, strategies to find errors
- BUGGIE (Suppes 1981): Mathematics
  - Identification of misconceptions using wrong (buggy) problems
- GUIDON (Clancey 1983): Medicine
  - Based on expert system MYCIN
  - Diagnose of diseases by natural language dialog
- MAIS (Tennison, Park 1987)
- Geometry Tutor (Koedinger, Anderson 1993)
- ISIS (Meyer, Miller et al 1999)
  - Ecology, simulation-based

Example for a MYCIN Rule

Abstraction Level

RULE-SCHEMA: MENINGITIS.COVERFOR.CLINICAL
RULE-MODEL: COVERFOR-IS-MODEL
KEY-FACTOR: BURNED
DUAL: D-RULE577

Performance Level

D-RULE578

IF: 1) The infection which requires therapy is meningitis, and
2) Organisms were not seen on the stain of the culture, and
3) The type of the infection is bacterial, and
4) The patient has been seriously burned
THEN: There is suggestive evidence (.5) that pseudomonas-aeruginosa is one of the organisms (other than those seen on cultures or smears) which might be causing the infection

UPDATES: COVERFOR
USES: (TREATINF ORGSEEN TYPE BURNED)

Support Level

MECHANISM-FRAME: BODY-INFRACTION.WOUNDS
JUSTIFICATION: "For a very brief period of time after a severe burn the surface of the wound is sterile. Shortly thereafter, the area becomes colonized by a mixed flora in which gram-positive organisms predominate. By the 3rd post-burn day this bacterial population becomes dominated by gram-negative organisms. By the 5th day these organisms have invaded tissue well beneath the surface of the burn. The organisms most commonly isolated from burn patients are Pseudomonas, Klebsiella-Enterobacter, Staph., etc. Infection with Pseudomonas is frequently fatal."
LITERATURE: MacMillan BG: Ecology of Bacteria Colonizing the Burned Patient Given Topical and System Gentamicin Therapy: a five-year study, J Infect Dis 124:278-286, 1971.
AUTHOR: Dr. Victor Yu
LAST-CHANGE: Sept. 8, 1976

W. Clancey: Use of MYCIN's Rules for Tutoring, *Intl. Journal of Man-Machine Studies* 11:25–49 (1979)

Example for a MYCIN Dialogue

You should now proceed to ask questions that will enable you
to make a hypothesis about the organisms (other than those
seen on cultures or smears) which might be causing the infection.

{Initiative is given to the student; he or she may ask for more data, make a hypothesis, or use a special option.}

**** HOW IS THE FACT THAT THE PATIENT IS BURNED RELEVANT?**

{One option is to ask how a piece of data is relevant to the current goal.}

The fact that patient-326 is seriously burned will be used to
conclude that pseudomonas-aeruginosa is one of the organisms which
might be present (in addition to those seen on cultures or smears)
[Rule 578].

**** HELP**

{The HELP option is a request for assistance: the student asks "where do I go from here?"}

Try to determine the type of the infection: bacterial,
fungal, viral, or Tb.

{To provide help, GUIDON chose: (1) a rule to discuss (d-rule 578 was chosen because the dialogue just focused on it); and (2) a method of presentation—"tell the student to finish incomplete subgoals mentioned in the rule." Thus, a new topic is set up, "the type of the infection." Initiative is returned to the student. . . . }

**** WHAT IS THE PATIENT'S WBC?**

The white count from the patient's peripheral CBC is 1.9 thousand.

{The tutor observes that this question is relevant to the new topic and provides the requested data. The dialogue continues in this goal-directed manner . . . }

Example: GeoTutor, 1992

Sample Dialogue:

** Let's talk about Western Canada

Fine. What is the capital of British-Columbia?

** Vancouver.

No, the capital of British-Columbia is Victoria.Where is Victoria situated?

** Let's discuss Banff.

I do not know Banff. Is Banff the name of a place?

** Yes. It is a town.

Where is Banff located?

** In the Rocky Mountains.

Is Banff in British-Columbia or in Alberta?

** In B.C.

What is the population of Banff?

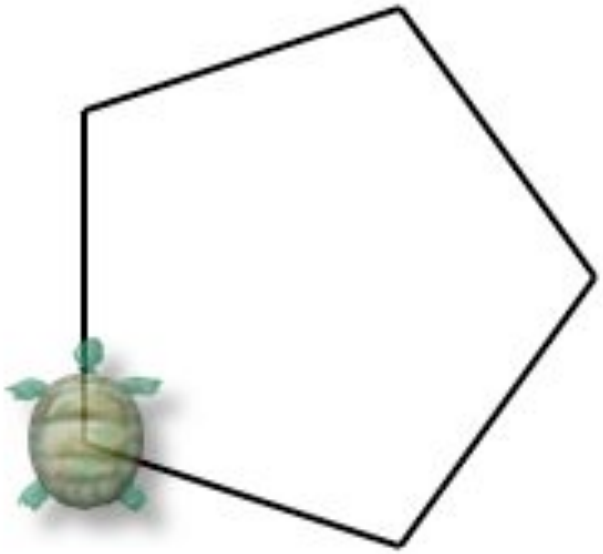
** 5000.

What other towns are near Banff?

** Tell me about Victoria.

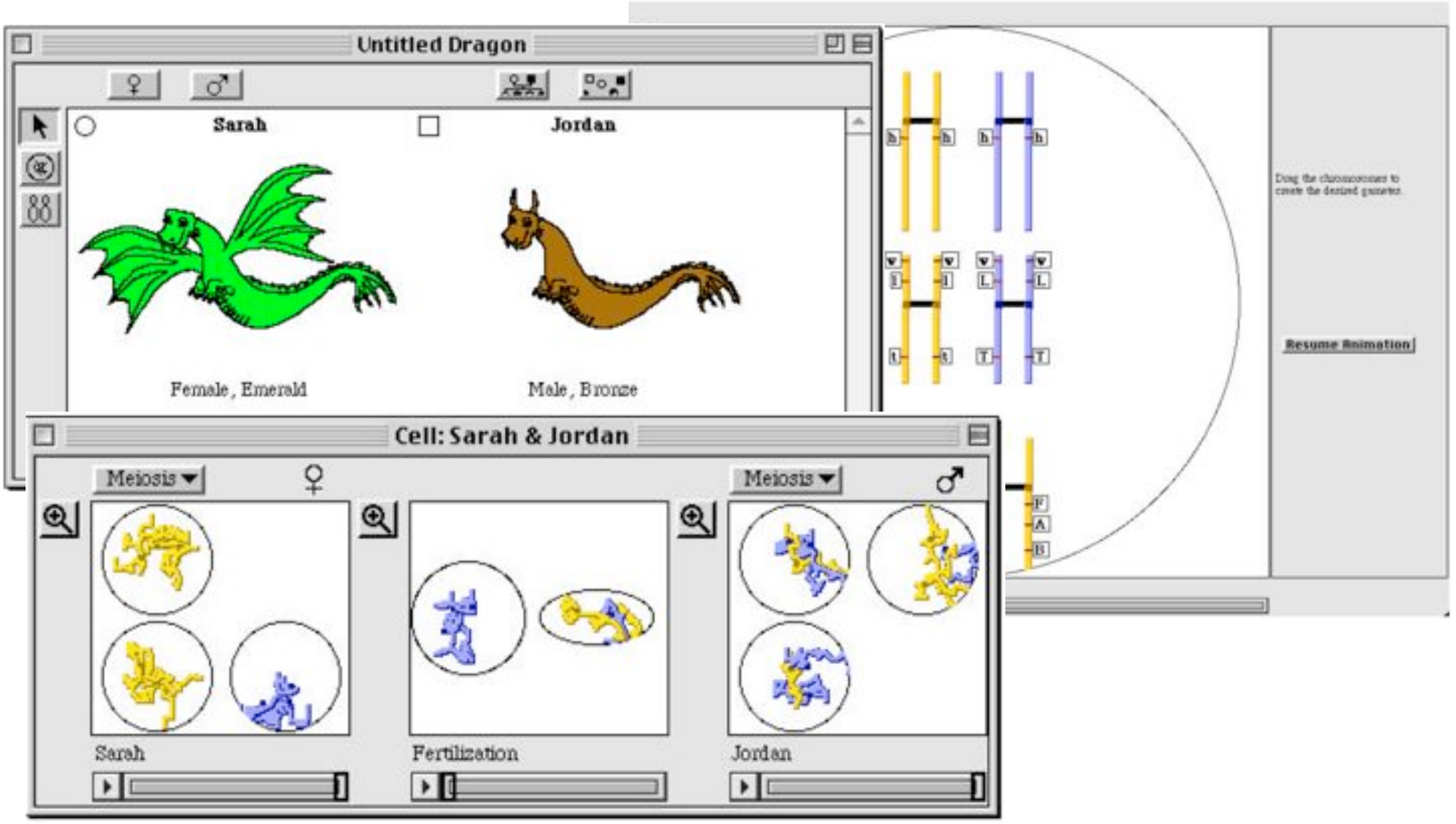
Victoria is situated on Vancouver Island. It is the second largest city in British-Columbia. What else would you like to know?

Logo (S. Papert, 1968): Physical and Virtual Turtles



```
to polygon
repeat :sides
      [ forward :size
        right 360/:sides ]
polygon 5 100
```

Example: GenScope, 1993



http://genscope.concord.org/

Online Learning Pioneer: CALCampus

- Computer Assisted Learning Center (CALC)
  - Since 1982 in Rindge, New Hampshire
- CALC Online Campus:
  - From 1985 through to 1995, starting with “QuantumLink Community College” using Commodore 64 computers on QuantumLInk network
  - Using telecommunication networks like AppleLink, AOL, CompuServe
- CALCampus.com, 1995
  - Online campus on the Internet

> CALCampus was the first to develop and implement the concept of a totally online-based school through which administration, real-time classroom instruction, and materials were provided, originating with the QuantumLink campus. This was a significant departure from earlier methods of distance education because no longer was the individual distance learner isolated from the teacher and from classmates.

10 Rückblick und Ausblick

Literatur:

Niegemann et. al., Kap. 18

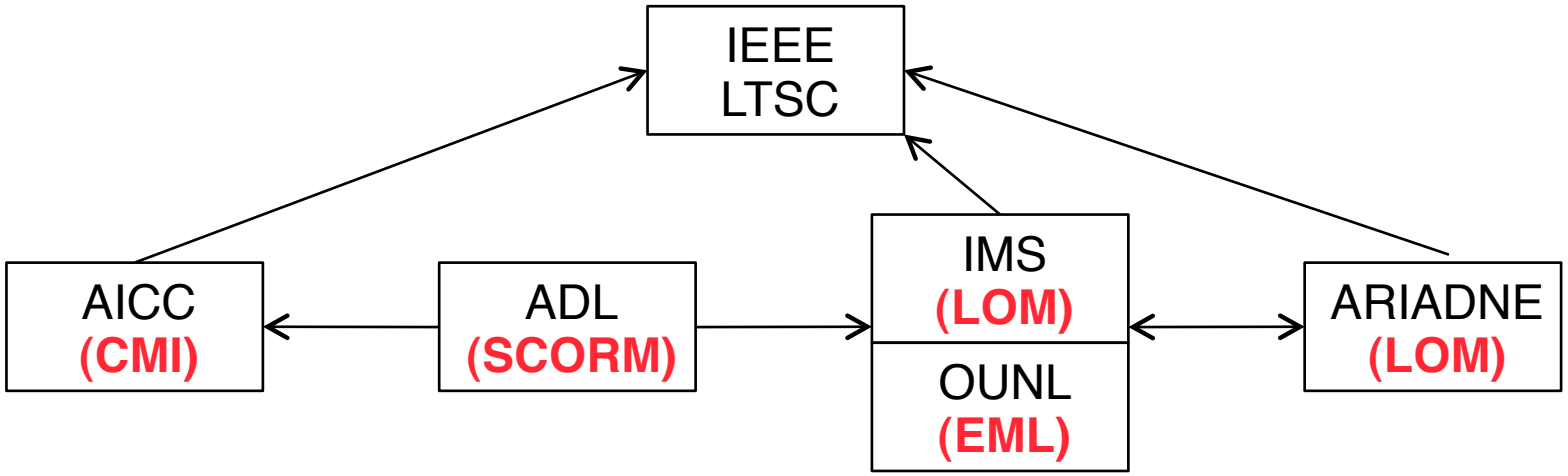
Hasebrook/Otte, Abschnitt 3.1

Haake et al., Kap. 4.6

Grundprinzip von E-Learning-Standards

- Zweck:
  - Unabhängigkeit der Inhalts-Autoren von speziellen Autorensystemen
  - Austauschbarkeit, Wiederverwendbarkeit, Anpassbarkeit von Lernressourcen
- Verfahren:
  - Beschreibung von Lernressourcen mit Metadaten
  - Analogie Bibliotheks-Metadaten
    - » MARC-Standard (Machine Readable Cataloging Record)
    - » Dublin-Core (DC)-Standard

Standard-Übersicht



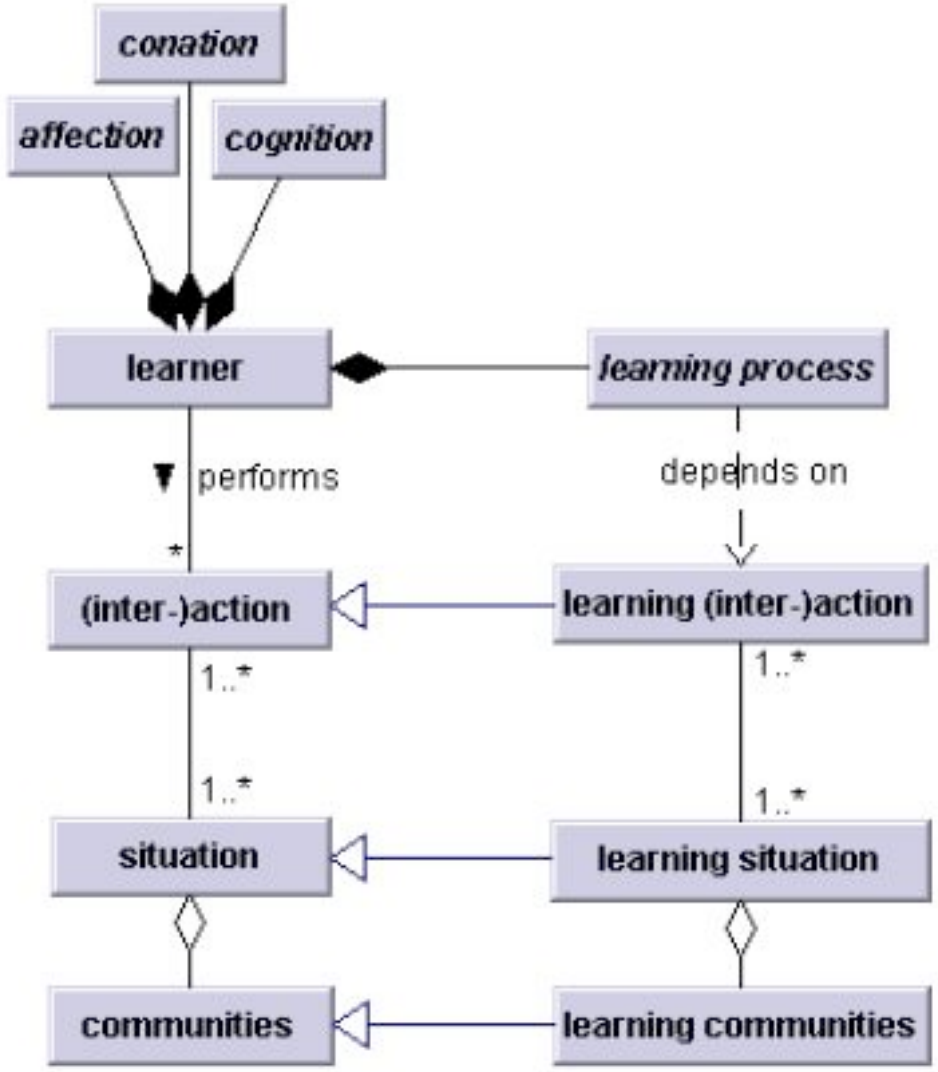
AICC = Aviation Industry Computer Based Training Committee
ADL = Advanced Distributing Learning Initiative
ARIADNE = Alliance of Remote Instructional Authoring and Distribution Networks for Europe
IMS = Instructional Management Systems Project
LTSC = Learning Technology Standards Committee
OUNL = Open University of the Netherlands
CMI = Computer Managed Instruction Systems
EML = Educational Modeling Language
LOM = Learning Object Metadata
SCORM = Shareable Content Object Reference Model

LOM: Learning Object Metadata

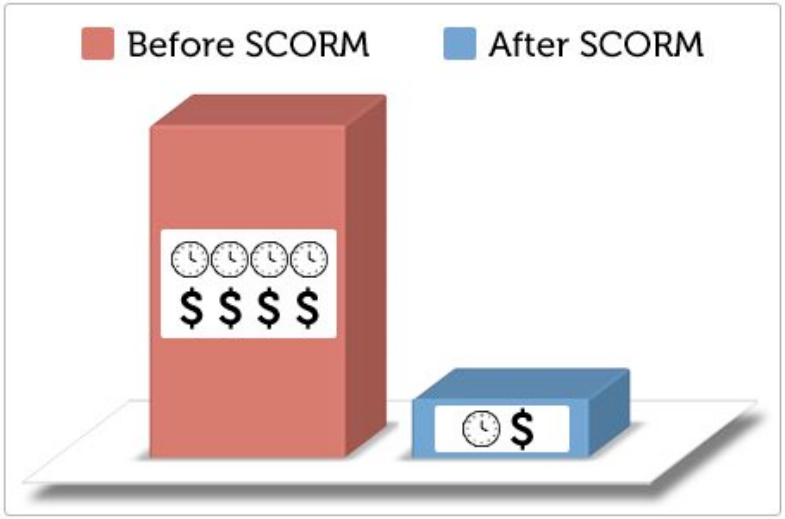
- http://ltsc.ieee.org/wg12/
- IEEE Standard P1484.12, XML-Based
- LOM Base Schema:
  - General information
  - Lifecycle (history)
  - Meta-metadata
  - Technical (requirements and characteristics)
  - Educational (educational and pedagoogic characteristics)
  - Rights (Intellectual Property Rights)
  - Relation (to other LOMs)
  - Annotation
  - Classification
- Ongoing development: Integration with other metadata standards for the Web (e.g. RDF)

Educational Modeling Language EML

- Example:
  Excerpt of metamodel
  (learning model)



SCORM



scorm.com

SCORM is composed of three sub-specifications

- The **Content Packaging** section specifies how content should be packaged and described. It is based primarily on XML.
- The **Run-Time** section specifies how content should be launched and how it communicates with the LMS. It is based primarily on ECMAScript (JavaScript).
- The **Sequencing** section specifies how the learner can navigate between parts of the course (SCOs). It is defined by a set of rules and attributes written in XML.

10 Rückblick und Ausblick

Life Cycle of Learning Systems

- as suggested by http://www.leerbeleving.nl/